

Chemistry - Central Science

CH. 3 Problems

26.b) % H in $\text{HC}_6\text{H}_7\text{O}_6$

$$\frac{8.064 \text{ g H}}{176.12 \text{ g}} \times 100 = \boxed{4.579\% \text{ H}}$$

$$\begin{array}{r} 8 \times 1.008 = 8.064 \\ 6 \times 12.01 = 72.06 \\ 6 \times 16.00 = 96.00 \\ \hline 176.124 \text{ g} \\ 176.12 \text{ g} \end{array}$$

27.b) $\text{C}_8\text{H}_8\text{O}_3$

$$\frac{96.08 \text{ g C}}{152.16 \text{ g}} \times 100 = \boxed{63.14\% \text{ C}}$$

$$\begin{array}{r} 8 \times 12.01 = 96.08 \\ 8 \times 1.01 = 8.08 \\ 3 \times 16.00 = 48.00 \\ \hline 152.16 \text{ g} \end{array}$$

28.b) CH_4O

$$\frac{12.01 \text{ g C}}{32.05 \text{ g}} \times 100 = \boxed{37.47\% \text{ C}}$$

$$\begin{array}{r} 12.01 \\ 4.04 \\ 16.00 \\ \hline 32.05 \text{ g} \end{array}$$

31.) .50 mol $\text{H}_2\text{O} \rightarrow 1\frac{1}{2}$ mol atoms

23 g Na = 1 mol Na \rightarrow 1 mol atoms

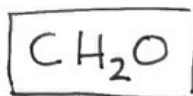
6.0×10^{23} molecules $\text{N}_2 = 1$ mol N_2

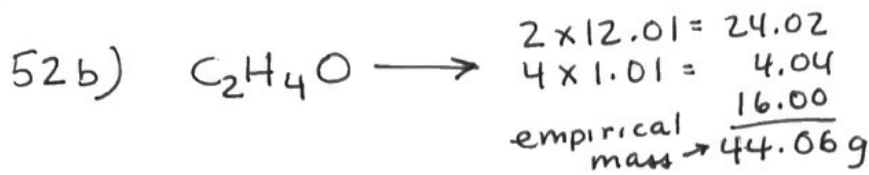
$$\boxed{\text{Na} < \text{H}_2\text{O} < \text{N}_2} \quad \begin{array}{l} 2 \text{ mol } \underline{\underline{\text{atoms}}} \end{array}$$

$$38.b) \frac{6.955 \text{ g } (\text{NH}_4)_2\text{CO}_3}{1} \times \frac{1 \text{ mol } (\text{NH}_4)_2\text{CO}_3}{96.11 \text{ g } (\text{NH}_4)_2\text{CO}_3} \times \frac{2 \text{ mol } \text{NH}_4^+}{1 \text{ mol } (\text{NH}_4)_2\text{CO}_3} =$$

$$\boxed{-1447 \text{ mol } \text{NH}_4^+}$$

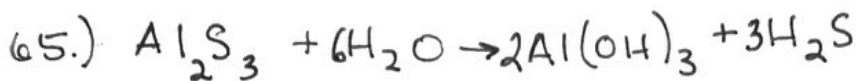
$$45.c) \begin{array}{l} \frac{40.0 \text{ g C}}{1} \times \frac{1 \text{ mol C}}{12.01 \text{ g}} = \frac{3.33}{3.33} = 1 \\ \frac{6.7 \text{ g H}}{1} \times \frac{1 \text{ mol H}}{1.01 \text{ g}} = \frac{6.63}{3.33} = 2 \\ \frac{53.3 \text{ g O}}{1} \times \frac{1 \text{ mol O}}{16.00 \text{ g}} = \frac{3.33}{3.33} = 1 \end{array}$$





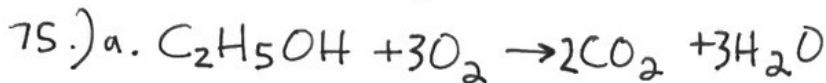
$$\frac{88.0}{44.06} = 2$$

$C_4H_8O_2$
 molecular formula



$$\frac{14.2g Al_2S_3}{1} \times \frac{1 mol Al_2S_3}{150.14g} \times \frac{2 mol Al(OH)_3}{1 mol Al_2S_3} \times \frac{78.01g}{1 mol Al(OH)_3} = \boxed{14.8g Al(OH)_3}$$

67.) at the end!



b. C_2H_5OH is LR

c. 1 molecule O_2 left over

4 molecules CO_2 produced

6 molecules H_2O produced

0 molecules C_2H_5OH remain

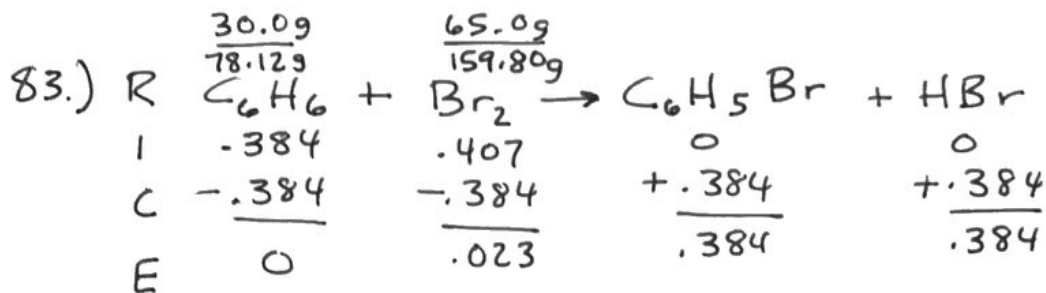
79.)

	$\frac{100g}{84.01g}$	$\frac{100g}{192.14g}$			
	$3 NaHCO_3$	$+ H_3C_6H_5O_7$	$\rightarrow 3CO_2$	$+ 3H_2O$	$+ Na_3C_6H_5O_7$
	(aq)	(aq)	(g)	(l)	(aq)
I	.0119	.00520	0	0	0
C	-.0119	-.00397	+.0119	+.0119	+.00397
E	0	.00123	.0119	.0119	.00397

a) $NaHCO_3$ is LR

b) $\frac{.0119 mol CO_2}{1} \times \frac{44.01g}{1 mol CO_2} = \boxed{.524g CO_2}$

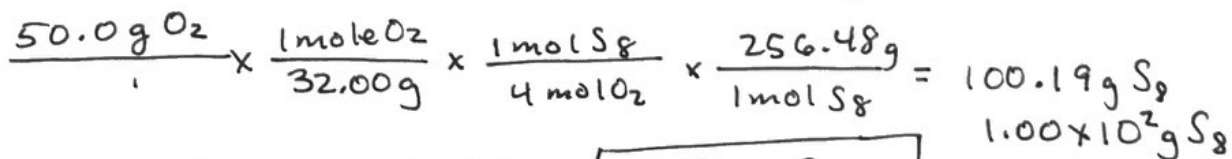
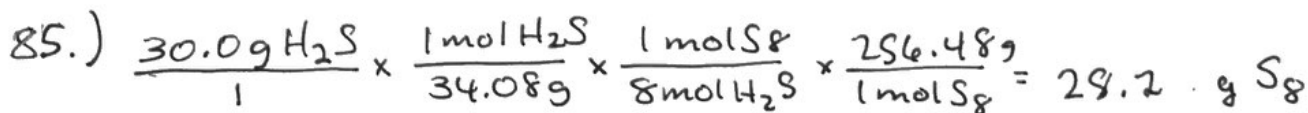
c) $\frac{.00123 mol H_3C_6H_5O_7}{1} \times \frac{192.14g}{1 mol} = \boxed{.236g H_3C_6H_5O_7}$



$$\frac{.384 \text{ mol } C_6H_5Br}{1} \times \frac{157.01g}{1 \text{ mol } C_6H_5Br} = \boxed{60.3g \text{ } C_6H_5Br}$$

Theoretical Yield

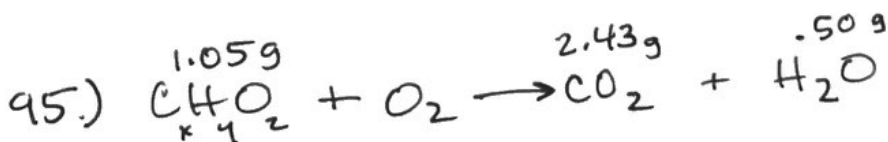
$$\% \text{ Yield} = \frac{42.3}{60.3} \times 100 = 70.1\%$$



$$28.2g \times .98 = \boxed{27.6g \text{ } S_8}$$

↓
Theoretical Yield

actual yield



$$\frac{2.43g \text{ } CO_2}{1} \times \frac{1 \text{ mol } CO_2}{44.01g} \times \frac{1 \text{ mol } C}{1 \text{ mol } CO_2} = \boxed{.0552 \text{ mol } C} \times \frac{12.01g}{1 \text{ mol } C} = .663g \text{ } C$$

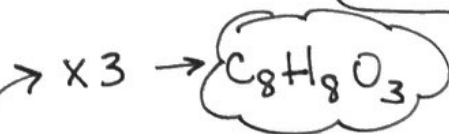
$$\frac{.50g \text{ } H_2O}{1} \times \frac{1 \text{ mol } H_2O}{18.02g \text{ } H_2O} \times \frac{2 \text{ mol } H}{1 \text{ mol } H_2O} = \boxed{.0555 \text{ mol } H} \times \frac{1.01g}{1 \text{ mol } H} = .0561g \text{ } H$$

$$1.05g \text{ Sample} - .663g \text{ } C - .0561g \text{ } H = .331g \text{ } O \times \frac{1 \text{ mol } O}{16.00g} = \boxed{.0207 \text{ mol } O}$$

C : H : O

$$\frac{.0552}{.0207} : \frac{.0555}{.0207} : \frac{.0207}{.0207}$$

$$2.67 : 2.68 : 1$$



96.) i) $3.52 \text{ g CO}_2 \times \frac{1 \text{ mol CO}_2}{44.01 \text{ g CO}_2} \times \frac{1 \text{ mol C}}{1 \text{ mol CO}_2} \times \frac{12.01 \text{ g C}}{1 \text{ mol C}} = .961 \text{ g C}$
 $\frac{.961 \text{ g C}}{1.50 \text{ g Sample}} \times 100 = \boxed{64.1\% \text{ C}}$ in the sample!

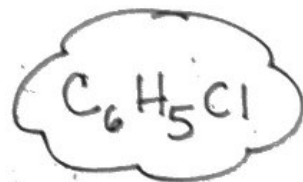
ii) $1.27 \text{ g AgCl} \times \frac{1 \text{ mol AgCl}}{143.32 \text{ g AgCl}} \times \frac{1 \text{ mol Cl}}{1 \text{ mol AgCl}} \times \frac{35.45 \text{ g Cl}}{1 \text{ mol Cl}} = .314 \text{ g Cl}$
 $\frac{.314 \text{ g Cl}}{1.00 \text{ g Sample}} \times 100 = \boxed{31.4\% \text{ Cl}}$ in the sample!

iii) $\% \text{ H} = 100\% - \underset{\text{C}}{64.1\%} - \underset{\text{Cl}}{31.4\%} = \boxed{4.5\% \text{ H}}$

iv) $\frac{64.0 \text{ g C}}{1} \times \frac{1 \text{ mol C}}{12.01 \text{ g}} = \frac{5.329 \text{ mol C}}{.8858} = 6$

$\frac{31.4 \text{ g Cl}}{1} \times \frac{1 \text{ mol Cl}}{35.45 \text{ g}} = \frac{.8858 \text{ mol Cl}}{.8858} = 1$

$\frac{4.5 \text{ g H}}{1} \times \frac{1 \text{ mol H}}{1.01 \text{ g}} = \frac{4.455 \text{ mol H}}{.8858} = 5$



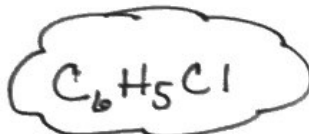
OR

i) $\frac{3.52 \text{ g CO}_2}{1} \times \frac{1 \text{ mol CO}_2}{44.01 \text{ g CO}_2} \times \frac{1 \text{ mol C}}{1 \text{ mol CO}_2} = \boxed{.0800 \text{ mol C}}$
 $.961 \text{ g C in a } 1.50 \text{ g Sample}$

ii) $\frac{1.27 \text{ g AgCl}}{1} \times \frac{1 \text{ mol AgCl}}{143.22 \text{ g AgCl}} \times \frac{1 \text{ mol Cl}}{1 \text{ mol AgCl}} \times \frac{35.45 \text{ g Cl}}{1 \text{ mol Cl}} = .314 \text{ g Cl}$
 $.314 \text{ g Cl in a } 1.00 \text{ g Sample}$

iii) $\frac{\text{Sample}}{1.50 \text{ g}} - \frac{\text{C}}{.961 \text{ g}} - \frac{\text{Cl}}{.471 \text{ g}} = \frac{\text{H}}{.068 \text{ g}}$
 $= \boxed{.068 \text{ g H}}$
 $\boxed{.067 \text{ mol H}}$
 $\frac{.314 \text{ g Cl}}{1.00 \text{ g Sample}} = \frac{x \text{ g Cl}}{1.50 \text{ g Sample}}$
 $x = .471 \text{ g Cl in a } 1.50 \text{ g Sample}$
 $\boxed{.0133 \text{ mol Cl}}$

iv) $\text{C} : \text{H} : \text{Cl}$
 $\frac{.0800}{.0133} : \frac{.067}{.0133} : \frac{.0133}{.0133}$
 $6 : 5 : 1$



67.) a.
$$\frac{1.50 \text{ mol NaN}_3}{1} \times \frac{3 \text{ mol N}_2}{2 \text{ mol NaN}_3} = \boxed{2.25 \text{ mol N}_2}$$

b.
$$\frac{10.0 \text{ g N}_2}{1} \times \frac{1 \text{ mol N}_2}{28.02 \text{ g N}_2} \times \frac{2 \text{ mol NaN}_3}{3 \text{ mol N}_2} \times \frac{65.02 \text{ g NaN}_3}{1 \text{ mol NaN}_3} = \boxed{15.5 \text{ g NaN}_3}$$

c.
$$\frac{10.0 \text{ ft}^3 \text{ N}_2}{1} \times \frac{1728 \text{ in}^3}{1 \text{ ft}^3} \times \frac{16.4 \text{ cm}^3}{1 \text{ in}^3} \times \frac{1 \text{ mL}}{1 \text{ cm}^3} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1.25 \text{ g}}{1 \text{ L}}$$

$$= \boxed{354 \text{ g N}_2}$$

$$\frac{354 \text{ g N}_2}{1} \times \frac{1 \text{ mol N}_2}{28.01 \text{ g}} \times \frac{2 \text{ mol NaN}_3}{3 \text{ mol N}_2} \times \frac{65.02 \text{ g}}{1 \text{ mol NaN}_3} = \boxed{548 \text{ g NaN}_3}$$